USDA Natural Resources Conservation Service

Ecological site F114XA302IN
Acidic Upland Forest

Last updated: 9/26/2024
Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 114X–Southern Illinois and Indiana Thin Loess and Till Plain

MLRA 114A makes up about 4,550 square miles (11,795 square kilometers). The three parts of this MRLA are mostly in the Till Plains Section of the Central Lowland Province of the Interior Plains. The western third of the western part is in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. The eastern half of the eastern part is in the Kanawha Section of the Appalachian Plateaus Province of the Appalachian Highlands. Both large and small tributaries of the Ohio River dissect the nearly level to very steep glaciated uplands in this area. The major streams and rivers have well defined valleys with broad flood plains and numerous stream terraces. The flood plains along the smaller streams are narrow. Broad summits are nearly level to gently sloping. Elevation ranges from 320 feet (100 meters) on the southernmost flood plain along the Ohio River to 1,250 feet (380 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters), but it can be 50 to 100 feet (15 to 30 meters) along drainageways and streams. Also, the Ohio River bluffs are as much as 300 feet (90 meters) above the river valley floor.

Classification relationships

USFS: 222 Eastern Broadleaf Forest (Continental) Province.

Homoya's Natural Regions of Indiana: Bluegrass Region

The following NatureServe Explorer Ecological System has a high level of probability to match the ecological site found on these soils. Southern Interior Low Plateau Dry-Mesic Oak Forest-Unique Identifier: CES202.898

Ecological site concept

Acidic Upland Forest sites were historically a mature hardwood forest community with oaks and hickories being the dominant canopy species. These upland sites are found on acidic soils. Decades of disturbance (logging, grazing, invasive vegetation, fire suppression, etc.) have impacted most sites that are still wooded. These disturbances have transitioned most sites to a mixed hardwood forest with less of an oak component that was historically present and an increase in maple, ash and tulip poplar. The majority of areas have now been converted for agricultural use.

Associated sites

F114XA502IN	**Till Uplands** Till Upland Forest. These sites are on upland till plains.

Similar sites

F114XA305IN	**Non-Acidic Upland Forest** The non-acidic upland forest sites also are dominated by a oak-hickory forest; however the species on these sites are those adapted to calcareous soils.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Carya glabra*
Shrub	(1) *Vaccinium*
Herbaceous	(1) *Agrimonia* (2) *Desmodium*

Physiographic features

These sites are generally located on hillsides, ridges, and till plains.

Table 2. Representative physiographic features

Landforms	(1) Upland > Hill (2) Upland > Ridge (3) Till plain > Till plain
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	104–366 m
Slope	6–18%
Water table depth	15–152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–25%
Water table depth	Not specified

Climatic features

About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms during summer. Snowfall is common in winter. The freeze-free period averages about 180 days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	153-158 days
Freeze-free period (characteristic range)	178-181 days
Precipitation total (characteristic range)	1,168-1,219 mm
Frost-free period (actual range)	153-159 days
Freeze-free period (actual range)	177-181 days

Precipitation total (actual range)	1,168-1,219 mm
Frost-free period (average)	156 days
Freeze-free period (average)	179 days
Precipitation total (average)	1,194 mm

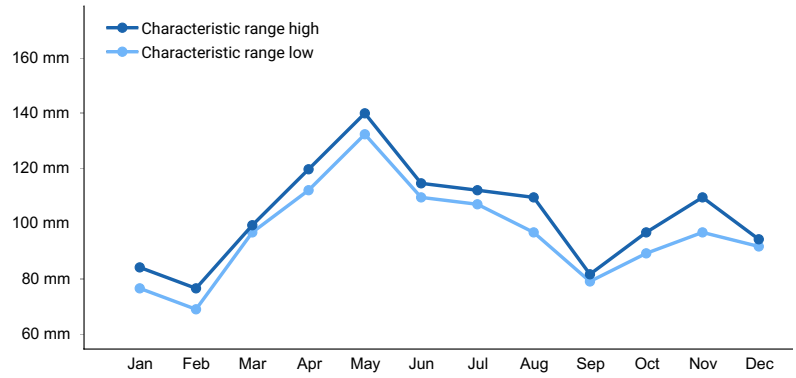


Figure 1. Monthly precipitation range

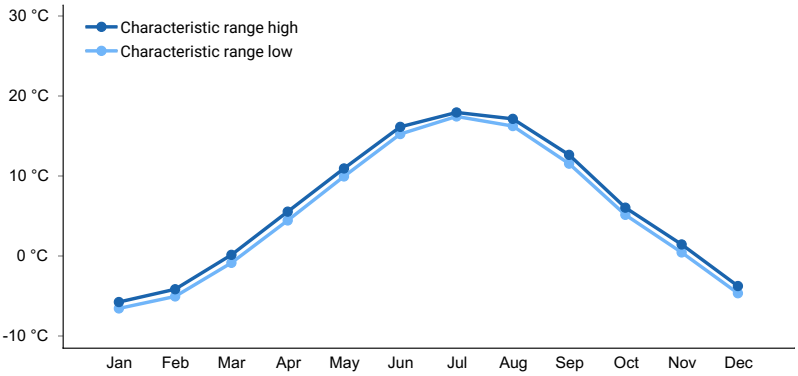


Figure 2. Monthly minimum temperature range

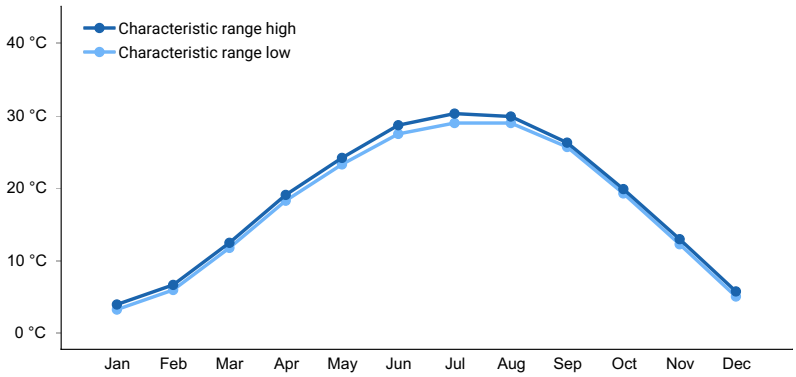


Figure 3. Monthly maximum temperature range

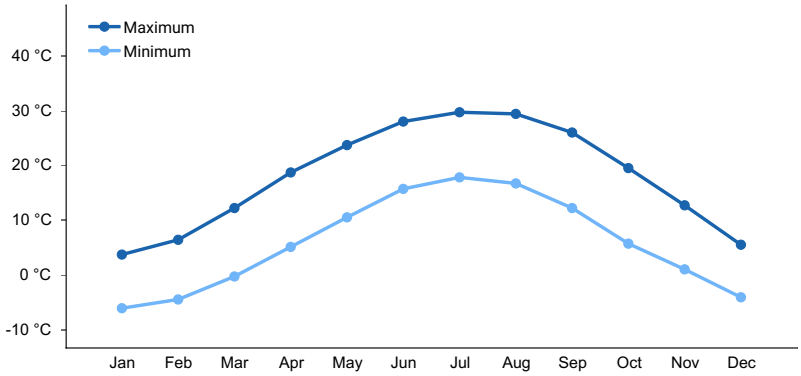


Figure 4. Monthly average minimum and maximum temperature

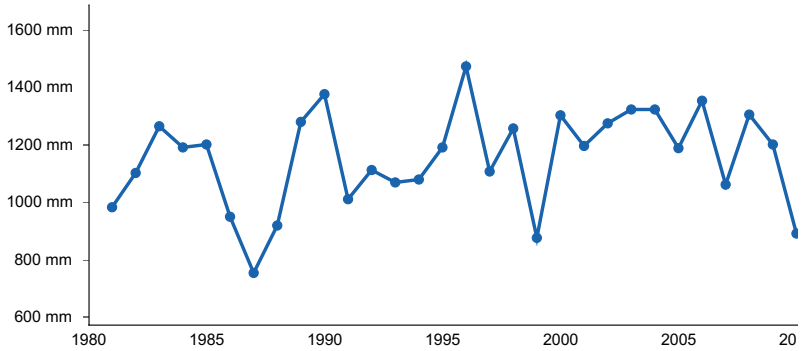


Figure 5. Annual precipitation pattern

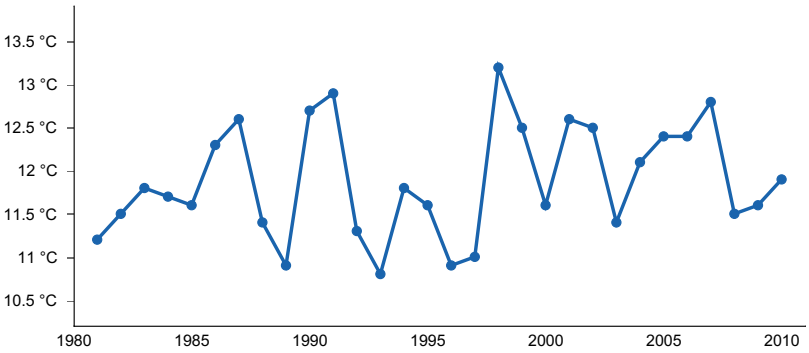


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SEYMOUR 2 N [USC00127935], Seymour, IN
- (2) LEXINGTON 3N [USC00124977], Lexington, IN
- (3) MILFORD [USC00335268], Milford, OH
- (4) NORTH VERNON 2 ESE [USC00126435], North Vernon, IN

Influencing water features

There are no riparian or wetland features influencing these sites.

Soil features

Soils associated with this site are acidic, often on black or gray shale. Series include Deputy, Gilpin, Jennings, Jessietown, Loudon, Loudonville, Mechanicburg, Rarden Scottsburg Trappist, Weddel, and Whitcomb.

Table 5. Representative soil features

Parent material	(1) Residuum–shale (2) Till (3) Loess (4) Slope alluvium
Surface texture	(1) Silt loam (2) Silty clay (3) Silty clay loam
Drainage class	Somewhat poorly drained to well drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	61–178 cm
Soil depth	43–152 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–2%
Available water capacity (Depth not specified)	10.16–15.24 cm
Soil reaction (1:1 water) (Depth not specified)	4.5–6
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Table 6. Representative soil features (actual values)

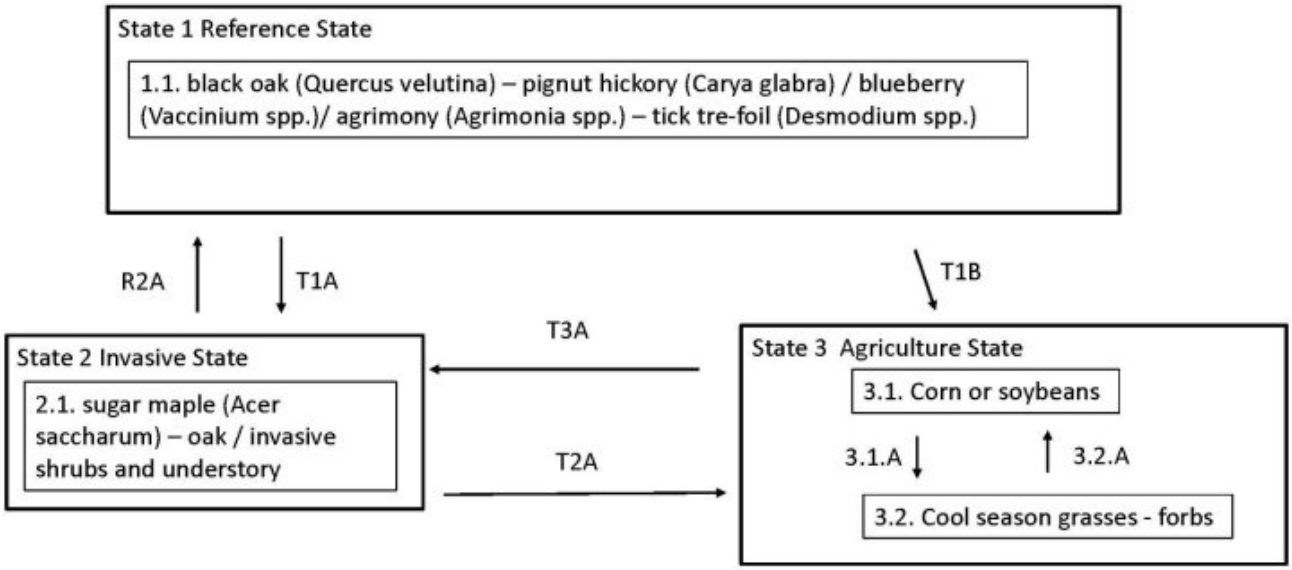
Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	7.62–17.78 cm
Soil reaction (1:1 water) (Depth not specified)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The historic plant community of this ecological site is an oak-hickory forest. Common species on these sites may include black oak (*Quercus velutina*), white oak (*Q. alba*), chestnut oak (Q montana), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), scarlet oak (*Q. coccinea*), flowering dogwood (*Cornus florida*), hophornbeam (*Ostrya virginiana*), and sassafras (*Sassafras albidum*). This site is naturally dominated by stable, uneven-aged forests with the canopy dynamics being driven by gap-phase regeneration.

Decades of disturbance (logging, grazing, fire suppression, etc.) have impacted these sites. Many sites now have a mixed hardwood forest with much less of an oak component that was historically present. Severe or long-term disturbances have transitioned sites toward a community of shade-tolerant species such as maple, ash and tulip poplar.

State and transition model



State 1
Reference State

This ecological site is an oak-hickory forest. Tree species on these sites may include black oak (*Quercus velutina*), white oak (*Q. alba*), chestnut oak (Q montana), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), scarlet oak (*Q. coccinea*), flowering dogwood (*Cornus florida*), hophornbeam (*Ostrya virginiana*), and sassafras (*Sassafras albidum*). Red maple (*Acer rubrum*) and black cherry (*Prunus serotina*) may be present. The herbaceous layer will vary depending on soil depth, rock content, and aspect, but often includes numerous vines, forbs, and herbs including: Vitis spp., *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Botrychium virginianum*, Carex spp., Agrimonia spp., *Polygonatum biflorum*, Maianthemum spp., *Galium circaezans*, *Geranium maculatum*, *Aquilegia canadensis*, *Asarum canadense*, *Erythronium americanum*, *Mitchella repens*, and *Polystichum acrostichoides*.

Dominant plant species

- black oak (*Quercus velutina*), tree
- white oak (*Quercus alba*), tree
- pignut hickory (*Carya glabra*), tree
- shagbark hickory (*Carya ovata*), tree
- blueberry (*Vaccinium*), shrub
- flowering dogwood (*Cornus florida*), shrub
- ticktrefoil (*Desmodium*), other herbaceous
- agrimony (*Agrimonia*), other herbaceous

- bedstraw (*Galium*), other herbaceous

Community 1.1
Reference Community

This ecological site is a mature hardwood forest. Common species on these sites may include black oak (*Quercus velutina*), white oak (*Q. alba*), chestnut oak (Q montana), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), scarlet oak (*Q. coccinea*), flowering dogwood (*Cornus florida*), hophornbeam (*Ostrya virginiana*), and sassafras (*Sassafras albidum*).

Dominant plant species

- black oak (*Quercus velutina*), tree
- white oak (*Quercus alba*), tree
- pignut hickory (*Carya glabra*), tree
- shagbark hickory (*Carya ovata*), tree
- blueberry (*Vaccinium*), shrub
- agrimony (*Agrimonia*), other herbaceous
- ticktrefoil (*Desmodium*), other herbaceous

State 2
Invaded State

This state is characterized by disturbance and subsequent increase in non-native invasive species. Species present will vary depending on disturbance severity and available seed sources.

Dominant plant species

- oak (*Quercus*), tree
- red maple (*Acer rubrum*), tree
- hybrid hickory (*Carya*), tree
- honeysuckle (*Lonicera*), shrub
- spindletree (*Euonymus*), shrub
- garlic mustard (*Alliaria petiolata*), other herbaceous

Community 2.1
Invaded community

This state is characterized by the establishment and eventual dominance of invasive species in the understory. Species will depend upon disturbance and seed sources. Sites can quickly be invaded by non-native plant species, and without management control, these prolific plants will alter the community composition of the understory/shrub layers and may negatively impact tree reproduction due to shading.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- red maple (*Acer rubrum*), tree
- honeysuckle (*Lonicera*), shrub
- spindletree (*Euonymus*), shrub
- garlic mustard (*Alliaria petiolata*), other herbaceous

State 3
Agricultural State

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. A small portion of the historic acres are used for forage and pasture. Some mapunits in this group are not appropriate for cropland due to high slopes, rock content, thin soils, and potential for erosion. Many of these sites are utilized as unmanaged pasture.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- brome (*Bromus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- white clover (*Trifolium repens*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1
Cropland

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. Many different crops and small grains may be grown on lower sloping sites - depending on management goals and objectives. Note: Many mapunits in this group are not appropriate for cropland due to high slopes, thin soils, and potential for erosion.

Dominant plant species

- corn (*Zea*), other herbaceous
- soybean (*Glycine*), other herbaceous

Community 3.2
Pastureland

This phase is characterized by forage or grazing agriculture. Different mixes of, generally, cool season grasses and forbs, largely clovers, are grown. Some of the mapunits in this initial PES grouping have high slopes that would preclude mechanical management. Often these sites are best left in ungrazed forest to protect soil resources.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- brome (*Bromus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Pathway 3.1.A.
Community 3.1 to 3.2

Management inputs are required to transition a cropland community to a pasture community. Site preparation, seeding, and weed control will be required. Species planted will depend on management goals and objectives.

Pathway 3.2.A.
Community 3.2 to 3.1

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production. Transitioning a pastureland to a crop field will require site preparation, seeding, and weed control. Species will depend on management goals and objectives. Note: some mapunits in this group are not suitable for cropland conversion due to thin soils and high slopes.

Transition T1A
State 1 to 2

Disturbance and lack of post-management inputs can result in numerous non-native plants gaining a foothold on these sites. Species will depend upon seed sources introduced. Common invasives include honeysuckle, euonymus, and garlic mustard.

Transition T1B
State 1 to 3

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. Many different crops and small grains may be grown on lower sloping sites - depending on management goals and objectives. NOTE: Many mapunits in this group are not appropriate for cropland due to high slopes, thin soils, and potential for erosion.

Restoration pathway R2A
State 2 to 1

Treatment and control of non-native vegetation will help restore these sites. Additional forest management activities may be needed including planting, selective thinning, and brush control.

Transition T2A
State 2 to 3

Transitioning an invasive wooded state to an cropland or pastureland community will require substantial management inputs. Clearing, site preparation, seeding, and weed control will be required. Species will depend on management goals and objectives. For pastures, many landowners utilize mixes of, generally, cool season grasses and forbs, largely clovers, are grown. Transitioning to a crop field will also require site preparation, seeding, and weed control. Note: Some of the mapunits in this initial PES grouping have high slopes that would preclude mechanical management. Often these sites are best left in ungrazed forest to protect soil resources.

Restoration pathway T3A
State 3 to 2

Agricultural sites that are abandoned will natural transition from a weedy herbaceous community to shrubs/saplings to a woodland state. Numerous non-native and native plants may be present depending on past use and adjacent seed sources. Fast growing trees such as maples, ash, locusts and poplars are often present on these sites.

Additional community tables

Inventory data references

No field monitoring was conducted as part of this PES development. Future ESD development will result in plant community edits, soil mapunits being added or removed from this grouping, and/or additions or modifications to the narratives, tables, vegetation descriptions and state and transition model.

Other references

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Approval

Greg Schmidt, 9/26/2024

Acknowledgments

PES documents developed for adjacent MLRAs in Indiana and Ohio served as a source of information as these regions often shared similar soil series with MLRA 114A. NRCS county soil surveys where a valuable reference including tree species observed on site by NRCS staff. Soil Survey and NRCS Indiana resource soil scientists contributed field observation, field notes, and extensive soil mapping expertise.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	A Arends, ESI Specialist
Contact for lead author	
Date	05/13/2025
Approved by	Greg Schmidt
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
